Remarks

With respect to **claim 1**, the applicant respectfully submits that the subject matter claims differs from the art taught in Kuzunuki et al. The applicant respectfully disagrees with the Examiner that Column 2, Lines 31-40 of Kuzunuki et al disclose a method of verifying a projected image with a three-dimensional view plane of an augmented-realty display system as a preselected movable real object in free space.

In the present invention, the orientation in free space of a preselected movable real object from a projected image of the object in a view plane of a video camera is claimed. The present invention discloses a method whereby the relative positions of points on the preselected object itself are recognized, and the coordinate positions of those points are calculated based only on the points' relative positions and known camera geometric dimensions. Further, the present invention is advantageous over Kuzunuki et al in that it does not require the preselected object to be at a known distance from the headset or viewing glasses. This creates a free range of motion for the preselected object which is optimal for user interactivity with the free space where the object is oriented.

As aforesaid, Kuzunuki et al disclose a processing system which operators can use to directly handle image objects displayed on a fixed desk display surface inserted into a desk by using actual objects placed on the desk. In order to interface the image objects displayed on the display surface with the actual objects located on the desk, attributes of the actual object are determined. The actual objects which can interface with the image objects are predefined (See FIG 3(b)) and are projected by a fixed overhead camera. From this projection, an operator managed menu (which is displayed on the display surface) stores the actual object attributes (area and ambient length) and the characteristics of the actual object (e.g. a facsimile machine or a file folder). Once the attributes of the actual object are stored, the location of the actual object on the desktop is inconsequential but, in order to interface the actual object with the display images, the actual object must remain on the desktop. As such, the method disclosed in Kuzunuki et al fails to teach the projection of a movable real object in three-dimensional free space.

Further, the applicant respectfully disagrees with the Examiner that Kuzunuki et al comprise the step of identifying representative characteristics of a movable real

object in free space within a three-dimensional view plane wherein the representative characteristics comprise shape and location. Kuzunuki et al specifically set forth the attributes of the predefined actual objects that are projected by the fixed overhead camera and stored (number of areas, area and ambient length are combined for recognition of the actual object). From these attributes, characteristic point coordinates (gravity center, center, corner and/or endpoints) are determined to identify the actual object to allow the image object (which is also identified by characteristic point coordinates) to interface with the actual object. As such, Kuzunuki et al utilizes identifiers and location of the actual object is not a representative characteristic.

Further, the applicant respectfully disagrees with the Examiner that Kuzunuki et al comprise the step of determining dimensional aspects of the movable object from the projected image. Specifically, Figures 7B and 8B; Column 9, Lines 9-25, as cited by the Examiner, disclose the method of interfacing the image objects with the actual objects wherein the characteristic point coordinate of the image object approaches that of an actual object (e.g. interfacing an image object with a facsimile actual object).

The applicant does agree with the Examiner that the actual objects must be defined in advance to enable direct touch of image objects and use of actual objects as man-machine interface parts but, the applicant respectfully disagrees with the Examiner that Kuzunuki et al comprise the step of computing a corresponding dimensional identity and location of the movable real object at an object point relative to the view plane. Of particular importance is the fact that the actual object is not in free space but must remain on the desktop to interface with the image object. As such, the only attributes of the actual object to be combined for recognition are the number of areas, area and ambient length. Therefore, dimensional identity and location of the actual object on the virtual desktop are not determining characteristics of the actual object and are not computed.

Finally, for the reasons set forth above in the preceding paragraph, the applicant respectfully disagrees with the Examiner that Kuzunuki et al comprise the step of verifying whether the dimensional identity and location of the actual object are consistent with predetermined standards for that actual object.

It is therefore respectfully submitted that claim 1 and claims 2-7 dependent on claim 1, are not anticipated by Kuzunuki et al.

Regarding **claim 2**, while the applicant does agree with the Examiner that some of the predefined actual objects that will interface with the image objects comprise a file (file abc) and a memo (Memo (g)), the Examiner fails to take into account that in the present invention, the preselected movable object that comprises the reference panel is disposed in free space (not located on the two-dimensional desktop surface). As such, the method set forth in the present invention mandates the recognition of a corner of the panel whereas the only attributes required to project and process the actual objects situated on the desktop are the number of areas, area and ambient length.

Regarding **claim 3**, the applicant respectfully disagrees with the Examiner that Kuzunuki et al further disclose a method wherein the dimensional aspects of the actual object is determined by calculating distance between corners and a center point. It is accurate that Kuzunuki et al utilize a coordinate system in coordinate input TB but, such coordinate system does not calculate dimensional aspects of the actual object on the desktop. Instead, the coordinate system determines the attributes of the actual objects to be combined for recognition (numbers of areas, area and ambient length) and identifies characteristic point coordinates.

Regarding **claim 4**, the applicant respectfully disagrees with the Examiner that Kuzunuki et al further disclose a method wherein the computing comprises converting the calculated distances to the dimensional identity and location based on an assumption that the reference panel is structurally flat. Again, of particular importance is the fact that the actual object is not disposed in free space but must remain on the desktop to interface with the image object. As such, the only attributes of the actual object to be calculated are the number of areas, area and ambient length. Therefore, dimensional identity and location of the actual object located on the desktop are not determining characteristics of the actual object and are not computed. Such a determination relative to the actual objects located on the desktop is neither necessary nor taught in Kuzunuki et al in that the distance positioning of the actual object relative to the camera will not change.

Regarding **claim 5**, the applicant respectfully disagrees with the Examiner that Kuzunuki et al further disclose a testing method similar to the present invention for verifying the identity and location of a preselected movable real object disposed in free space. The actual object is located on the desktop. Attributes of the actual object are

determined and stored in the attribute definition menu on the display surface. From these attributes and the fixed overhead camera, location of the desktop can determined. As such, actual object dimensional characteristics (corners, right angles, center points and the like) need not be verified to determine the identity and location of the actual object on the desktop.

Regarding **claim 6** and **claim 7**, the applicant respectfully disagrees with the Examiner that Kuzunuki et al further disclose a method wherein the actual object is comprised of three equidistant line points and the projected dimensions of the three equidistant line points are determined. Further, the applicant respectfully disagrees with the Examiner that Kuzunuki et al disclose a method to calculate object coordinates in real space of the object point on the projected dimensions of the three equidistant line points in the view plane. As aforesaid, the actual object is identified by its attributes on the display surface not by equidistant line point on a view plane of the fixed overhead camera. In that the actual object is located on the desktop and not disposed in free space, projected dimensions are not determined. Instead, once the attributes of the actual object are stored, the actual object can be moved to any location on the desktop and the Kuzunuki et al processing system will be able to identify the actual object from said attributes. As it relates to the present invention, because the preselected movable real object is disposed in free space, the X, Y and Z coordinates of the preselected object must be calculated to determine location of the object in the augmented-realty display system.

With respect to **claim 8**, arguments analogous to those presented for claim 1 are applicable to claim 8.

Further, the applicant agrees with the Examiner that Wilson et al teach a method of identifying distinctive points of an image in a region by way of a pair of cameras coupled to a headset or visor; determining current three dimensional positions of the distinctive points and; analyzing the three-dimensional positions using analytic geometry, trigonometry, and basic matrix operations to determine position and orientation of the camera pair relative to the image. However, there was no motivation at the time of invention to combine the references of Kuzunuki et al and Wilson et al in that Wilson et al teach away from Kuzunuki et al.

Kuzunuki et al relates to an information processing system which operators can use to directly handle image objects displayed on a relative fixed desk display surface inserted into a desk by using actual objects placed on the desk. As such, Kuzunuki et al were not operable, nor intended to operate, in a system where the reference object is located other than on the desk display surface. Wilson et al relates to duel realty system comprising an apparatus for merging real and virtual images in which computer generated objects and images similar to those created by virtual reality systems appear to the user in the real world.

Accordingly, the applicant respectfully submits that it would not have been obvious to a person of ordinary skill in the relevant art at the time the present invention was made to modify Kuzunuki et al according to the teachings of Wilson et al.

It is therefore respectfully submitted that claim 8 and claims 9-12 and 17 dependent on claim 8, distinguish patentably and unobviously over Kuzunuki et al in view of Wilson et al.

Regarding **claim 9** and **claim10**, arguments analogous to those presented for claim 6 are applicable to claim 9 and claim 10.

Regarding **claim 11**, arguments analogous to those presented for claim 7 are applicable to claim 11.

Regarding **claim 12**, arguments analogous to those presented for claim 5 are applicable to claim 12.

With respect to **claim 13**, arguments analogous to those presented for claim 1 are applicable to claim 13.

It is therefore respectfully submitted that claim 13 and claims 14-16 dependent on claim 13, are not anticipated by Kuzunuki et al.

Regarding **claim 14**, arguments analogous to those presented for claim 2 are applicable to claim 14.

Regarding **claim 15**, arguments analogous to those presented for claim 8 are applicable to claim 15.

Regarding **claim 16**, arguments analogous to those presented for claim 5 are applicable to claim 16.

Regarding **claim17**, arguments analogous to those presented for claim 8 are applicable to claim 17.

CONCLUSION

For the reasons detailed above, it is respectfully submitted all claims remaining in the application (Claims 1-17) are now in condition for allowance. The foregoing comments do not require unnecessary additional search or examination.

No additional fee is believed to be required for this Amendment A. However, the undersigned attorney of record hereby authorizes the charging of any necessary fees, other than the issue fee, to Xerox Deposit Account No. 24-0037.

In the event the Examiner considers personal contact advantageous to the disposition of this case, he is hereby authorized to call the undersigned, at Telephone Number (216) 861-5582.

Respectfully submitted,

FAY, SHARPE, FAGAN,
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2/24/04
Date

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